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RECORD OF ORAL HEARING
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte NAOYUKI KOFUJI,
MASAHITO MORI, KENE'ETSU YOKOGAWA,
NAOSHI ITABASHI, KAZUNORI TSUJIMOTO
and SHIN'ICHI TACHI

Appeal 2007-2849
Application 09/363,191
Technology Center 1700

Oral Hearing Held: November 6, 2007

Before EDWARD C. KIMLIN, CHUNG K. PAK, and LINDA M.
GAUDETTE,
Administrative Patent Judges

ON BEHALF OF THE APPELLANT:

JOHN R. MATTINGLY, ESQUIRE
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1 The above-entitled matter came on for hearing on Tuesday,
2November 6, 2007, commencing at 2:29 p.m., at The U.S. Patent and
3Trademark Office, 600 Dulany Street, Alexandria, Virginia, before Deborah
4Rinaldo, RPR, Notary Public Registration No. 292810.

5 JUDGE KIMLIN: Good afternoon, Mr. Mattingly.

6 MR. MATTINGLY: Good afternoon.

7 JUDGE KIMLIN: You can begin when you are ready. You
8have about 20 minutes. Our reporter today is Debbie.

9 MR. MATTINGLY: Well, may it please the Board, I'm John
10Mattingly and I'm here to discuss the rejections of record, the 35 USC 112
11first paragraph rejection and the 35 USC section 103 rejections. I'll discuss
12those in a group, more than likely. Since we have a 112 first-paragraph
13rejection, I think it's a good idea to cover the salient points of the invention
14as we get started.

15 This case is an etching apparatus and it has a magnetic field
16plasma generator. Pretty much figure 1 shows a general overview of the
17invention.

18 At issue in this case is the fact that there is an antenna --
19microstrip antenna, an MSA 4, and there is UHF high frequency applied to
20the antenna. In the presence of an antenna, a plasma is generated. There is a
21reactive gas that's supplied through the shower plate 9 and there is a wafer
22situated on the stage 7.

23 These are all the important points of the invention that are
24claimed and have come up in the rejections. One important aspect of this
25invention is that the relationship between the antenna and the UHF, the
26dimension of the electrode, the discoidal electrode to which the UHF is

1applied and the wafer diameter provides a resonance in the TM01 mode.

2 And this becomes a point of distinction over the prior art and an
3important point in achieving the objectives of this invention which are really
4to provide a uniform inplane distribution of the ion current density which
5provides a uniform etching rate across the surface of the wafer.

6 And this also ensures a uniform etching rate provided in low-
7pressure conditions which are found in anisotropic etching and the low-
8pressure conditions that are discussed in the specification.

9 So I would like to discuss the 35 USC 112 first-paragraph
10rejection. In particular, properly the rejection is a failure to comply with the
11written restriction requirement.

12 In detail, what we have here is an application which has been
13prepared in Japan, filed in the U.S. And according to the way in which the
14inventors decided to present this application first it was discussed that an
15antenna -- the MSA antenna 4 is known in the prior art.

16 The applicant cited the Japanese Laid Open 8-337887 as
17disclosing a microstrip antenna and MSA, having the basics of a discoidal
18electrode 1, a grounded dielectric 2 and a high-frequency electrode 3, and
19the dielectric is sandwiched between the two electrodes, and this generates
20the plasma that's shown in figure 2.

21 The examiner has essentially taken the position that figure 2
22comes out of the prior art as if it comes out of one of the figures of the
23Japanese Laid Open patent. However, that's not really the case.

24 The figure 2 is the applicant's own rendering of what they
25wanted to disclose was known in the prior art with respect to existing
26antennas, existing MSA antenna. And they found that to be an important

1point in disclosing the state of the art from which they were improving upon.

2 And when they came around to disclosing figure 1, which is an
3overall view of the invention, they incorporated the structure of an MSA
4antenna shown at 4, including elements 1, 2 and 3, but they did not show
5that element 1 is grounded in figure 1. It just showed that element 1 is
6grounded in figure 2.

7 The examiner has taken the position that since element 1, which
8is the grounded earth electrode, is not shown as being grounded in the figure
91, that applicants are presenting a claim that's not supported under 112 first
10paragraph when the claim sets forth a grounded electrode as part of the
11antenna structure that's being claimed.

12 Applicants or appellants take the position that the disclosure of
13the MSA is shown in sufficient detail in figure 2 because that's how those of
14ordinary skill in the art understand these antenna structures. They have the
15high-frequency electrode 3. They have the grounded electrode 1, and a
16dielectric in between the two.

17 The high frequency is applied to 3. 1 is grounded. That's how
18you generate a plasma. And when you put those same reference numbers
19and you call them the same things in figure 1, you have the same details
20applied there. And applicants should be permitted to claim that.

21 And in detail, one having ordinary skill in the art would
22understand that the MSA antenna shown in figure 1 labeled 4 includes those
23elements that are set forth in figure 2 are otherwise well known in the art at
24the time of the invention.

25 JUDGE KIMLIN: Are you saying that the claimed MSA
26antenna in claim 1 is within the prior art?

1 MR. MATTINGLY: Yes.

2 JUDGE KIMLIN: That's not a novel feature of the invention?

3 MR. MATTINGLY: Not by itself, no. It's part of the prior art,
4and that's really what I have to say about 112.

5 But your question leads into the 103 rejection because the
6claimed invention is rather close to the prior art. The Yokogawa reference is
7showing -- first of all, it's their coworker. It's also the real party in interest
8here is Hitachi Limited. This reference is also a Hitachi Limited patent or
9European publication.

10 The main figure that's relied upon by the examiner making the
11rejection under 103 as to figure 1, figure 1 is showing, you know, many of
12the aspects of the claimed combination. And I would like to point out the
13differences.

14 In figure 1, there is no separation plate that's used as a dielectric
15between the antenna and the inside of the chamber, which is the feature set
16forth in claim 1, six paragraphs down, it looks like. Seven paragraphs down.

17 And the antenna structure that's shown in figure 1 is -- although
18it is a plate antenna in figure 1 of Yokogawa, that's shown better in figure 2,
19it includes an earth electrode 105 and a high-frequency electrode 107 and it
20has a dielectric plate 106 sandwiched between them.

21 The difference here is that the diameter of the discoidal
22electrode, which would be equivalent to that 107 shown in figure 2 of
23Yokogawa, is not larger or not greater than that of the wafer or equal to that
24of the wafer as set forth in claim 1. Actually, claim 1 sets forth the diameter
25of the discoidal electrode is not less than that of the wafer.

26 The reason for the entire claimed combination of claim 1 is to

1focus on sort of the improved aspects of this invention which were to create
2resonance in the TM01 mode. In Yokogawa, the description of figure 1
3discusses that the resonance really is in the TM11 mode.

4 As I understand it, the difference in these modes of operation
5are important when it's considered that this invention was applied in low
6pressure -- it is intended to be applied in a low-pressure situation of etching.

7 And the reason that the applicant or the appellants are able to
8achieve the TM01 mode is the application of the UHF providing the antenna
9structure outside of the etching chamber. In other words, including the
10separation plate in between the antenna and the wafer where the plasma is
11being generated for etching the wafer.

12 JUDGE GAUDETTE: I don't think you really address a couple
13of points that are raised by the examiner. The examiner is relying on figure
1412 to show the separation plate. And in the description of figure 12, there is
15a discussion that that particular structure can be used in figure 1, the
16apparatus of figure 1. It's in column 17.

17 MR. MATTINGLY: I was going to get to that in a moment.

18 JUDGE GAUDETTE: Similarly, with respect to your
19arguments regarding the TM01 mode, the examiner again points out that in
20column 5 of the reference, the diameter is set to a diameter in which the
21resonance mode of the electromagnetic wave can be obtained. So the
22examiner is saying that it's the TM11 mode there is just exemplary.

23 MR. MATTINGLY: I understand that's the point the examiner
24was making.

25 I think that in reading this reference -- let me address your
26second point first -- is that the diameter of the circular conductive plate 107

1is set specifically to excite in the TM11 mode and there is no -- the reference
2doesn't have a teaching with respect to the way in which you would arrive or
3the motivation for arriving at the TM01 mode.

4 JUDGE GAUDETTE: But to me this reference does not
5specifically say that teaching is limited to the TM11 mode unless you want
6to point out why we should interpret it in that manner. Because it says in
7this embodiment the circular conductive plate 107 is set to a particular
8diameter which can be excited in the TM11 mode. The TM11 mode is one
9of propagation types of an electromagnetic wave.

10 MR. MATTINGLY: Well, thank you for your comment. I
11can't add any more to that difference except to note that the reference is not
12teaching that particular mode that's claimed by applicants, specifically as set
13forth in claim 8. In other words, the claim 1 doesn't exactly claim the mode
14of resonance, but claim 8 does claim a mode of resonance.

15 As I understand it, the TM01 is an axial resonance mode. And
16it's quite specific with respect to the various factors that are involved here in
17the claimed combination, the ultra high frequency, the difference in the
18diameter of the electrode and the wafer and the separation plate.

19 The first point that you made about the embodiment of figure
2012, the antenna structure in that embodiment is not a plate antenna. And it's
21shown in --

22 JUDGE GAUDETTE: I understand that. But again, it says that
23the system in this embodiment in which the electromagnetic wave radiator is
24installed in a place which is not vacuum and can be also applied to not only
25the apparatus equivalent to the fourth embodiment shown in figure 9 but the
26apparatuses equivalent to the first embodiment shown in figure 1.

1 Figure 1 does have that particular antenna structure that you are
2claiming.

3 MR. MATTINGLY: I understand that. And in figure 1 we
4have the discussion about the differences in diameter of the wafer with
5respect to the electrode and how that in the present invention sets forth the
6resonance in the TM₀₁ mode which they are trying to achieve. But in the
7earlier reference in the prior art it's resonating in the TM₁₁ mode.

8 JUDGE GAUDETTE: Now, you argue that the wafer is larger
9in, I guess, figure 1 of the reference; is that correct?

10 MR. MATTINGLY: Um-hum.

11 JUDGE GAUDETTE: Is that something you are arguing based
12on the figure itself or is there actually disclosure in the reference that states
13that the wafer diameter is always larger?

14 MR. MATTINGLY: It's really a reliance on the figures. It's
15not just reliance on figure 1 but also on the figure which shows --

16 JUDGE GAUDETTE: Is that strictly how it's depicted or are
17you basing it on some written disclosure within the reference?

18 MR. MATTINGLY: I'm not basing it on a written disclosure in
19the reference other than to -- other than that it's generally conveyed to one of
20ordinary skill in the art when considering, for example, figures 8 and 9 that
21if the wafer were larger -- sorry.

22 If the wafer is larger than the electrode, then you start to have a
23problem with the edge being nonuniform and the current density as
24compared to the center point of the wafer, which is one of the main objects
25that is trying to be overcome by this invention.

26 And that is also brought out in those claims 39 and 40 with

1respect to another factor that's involved in providing a uniform ion current
2distribution, and that is the diameter of the shower head being three-quarters
3of the wafer diameter.

4 I realize that these are relationships and they are claimed -- and
5they are close to the prior art, but I think that they are not shown or disclosed
6in the reference. And this is why the appellants are asserting patentability of
7the claim.

8 JUDGE PAK: Counsel, is the size of the wafer always the
9same conventionally or does the size vary?

10 MR. MATTINGLY: I don't know that -- well, there's certainly
11not anything in the specification with respect to that point. I think from
12inspection it can be seen that the wafer -- that in figure 1 where this shows a
13wafer 8 on the sample support 7, there is a sort of maximum size that could
14be put there, it appears.

15 JUDGE PAK: I mean, conventionally is the wafer different
16sizes?

17 MR. MATTINGLY: I think wafers are sliced from a rule and
18they are all the same diameter, conventionally. I believe my understanding
19is correct on that. And so I would expect that at least in -- I think the
20examiner was trying to make the point that the wafer could be of any size.

21 If the wafer that were put on the stage 7 were much greater
22diameter than the one shown -- the one wafer 8 which is shown in figure 1, it
23doesn't look like it would fit there. And it doesn't look like it would.

24 JUDGE PAK: Well, if one came up with a wafer of a newer
25size and your etching apparatus is modified at least the size of the electrode,
26is it modified to make it not less than that of the wafer, that I just come up

1with the size of the wafer?

2 If the diameter happens to be the same size what's already out
3there, would that -- technically speaking, this claim would include that
4conventional electrode size?

5 MR. MATTINGLY: Well, I think that as I understand the point
6that's being made about the wafer size with respect to the electrode size is
7that if the wafer diameter is bigger than the diameter of the electrode, then
8you are going to be outside the outside edges or the periphery of the wafer is
9going to be outside the area that can receive a constant or uniform ion
10current density.

11 JUDGE PAK: But you are not claiming the wafer in this listing
12claim 1; am I correct? You are claiming the dry etching apparatus and
13where you define the diameter of discoidal electrode in relationship to wafer
14not just one that is presently known, but the one that can be produced in the
15future.

16 Am I correct, any and all wafer sizes, you are including it in
17this claim in relation to the diameter of the electrode?

18 MR. MATTINGLY: The best -- well, let me point out that the
19relationship between the discoidal electrode and that of the wafer in terms of
20diameter is tied into the sample holder in paragraph 2 of the claim where it
21says that it's designated to hold a wafer of a predetermined diameter.

22 So I think that in your scenario of changing apparatus and
23wafers over time that the sample holder would still be designated to hold a
24wafer of a certain diameter, and the patentability of this claim would be
25directed to the diameter of the electrode being not less than that of the wafer
26in order to maintain the uniform ion current density which is really one of

1the main objects of the invention.

2 JUDGE PAK: Let me ask you in the reverse manner. If a guy
3has exact same apparatus as you have except the predetermined diameter of
4the wafer is a little bit bigger than the diameter of, say, discoidal electrode,
5he has not used it yet, but he has exact same dry etching apparatus as you
6have, would he be infringing your patent?

7 MR. MATTINGLY: I'm sorry, your question?

8 JUDGE PAK: If he has identical dry etching apparatus as you
9have except when in use that the diameter of the electrode is less than that of
10the wafer.

11 MR. MATTINGLY: So in order for the diameter electrode to
12be less than the wafer, he would have to be using --

13 JUDGE PAK: Predetermined size. So I came up with that the
14wafer's little bigger than or little smaller than the conventional size. So dry
15etching apparatus-wise is identical to yours, but in use, obviously is not less
16than that of the wafer.

17 MR. MATTINGLY: I understand your point now.

18 JUDGE PAK: Would that be infringing apparatus or would
19you say it's not infringing apparatus until he uses it?

20 MR. MATTINGLY: I would say that -- I see what your point
21is directed to, whether the wafer is included in the claim or not.

22 I think that as a practical matter, and this is an invention
23directed to an actual apparatus, I think you can gain that from the disclosure
24considering all of the technical data that's presented along in all of the
25figures, that there really is a sample holder that's designed to hold a wafer of
26a certain size.

1 And considering not only in Yokogawa do they mention that
2the wafer diameter and the electrode diameter is important to achieve the
3TM resonance that's mentioned there, but it's also important in this invention
4and I think it's generally important in the field of art that this invention is in,
5and it's difficult to distinguish these claims over the prior art without in some
6respect bringing in a wafer diameter in a practical application.

7 It's mentioned in the prior art. It's difficult to put into this claim
8language, this relationship, without making the wafer a certain part of the
9claim.

10 I don't think it's the main part of the claim. The examiner and I
11talked about this, but I think that because there is a sample holder that's
12intended to designate a wafer of a predetermined diameter, it is in the claim
13at least inferentially.

14 JUDGE GAUDETTE: You could have a holder that was, say, a
15ten-inch diameter and the wafer could be anywhere between one and ten
16inches. So it really doesn't define --

17 MR. MATTINGLY: I agree with your point. However, you
18wouldn't put an 11-inch wafer in there. So the wafer is not going to exceed
19the size of the discoidal electrode.

20 In other words, if it's a stage that's designed for a 10-inch wafer
21and it's a 10-inch discoidal electrode or, say, 11-inch discoidal electrode, you
22are not going to get a wafer into that that's bigger than what it's designed for.

23 JUDGE GAUDETTE: Perhaps your claim should have drawn
24a relationship between the diameter of the discoidal electrode and the sample
25holder. That's not in there, is it?

26 MR. MATTINGLY: I think that for in terms of what's

1supported by the specification, this is as close as I could draw that line, it
2seems to me.

3 JUDGE KIMLIN: In general, ordinarily the material operated
4on in an apparatus that's not --

5 MR. MATTINGLY: I don't think this is a case where that is --
6I don't think that that applies completely to this because we didn't just claim
7the wafer itself but rather the wafer would be of a certain size as it fits within
8this sample holder.

9 JUDGE PAK: Are you including the wafer in the claim? You
10are claiming a combination?

11 MR. MATTINGLY: We tried not to include the wafer in the
12claim by making the discoidal electrode have the limitation of the diameter
13and by making the sample holder just designated to hold a wafer of a
14predetermined diameter.

15 So in one sense if you read that limitation, the sample holder
16holds a wafer of a predetermined diameter, it's not really whether the wafer
17is in the apparatus or not. You still have a sample holder that's designated to
18hold a wafer of a predetermined diameter.

19 And whether or not the wafer is in the apparatus or not, the
20diameter of the discoidal electrode is still not less than that of the wafer
21because that includes a range of a diameter -- a wafer of a diameter as large
22as what can be held by the sample holder right down to something smaller.

23 But it excludes a wafer that can be larger than what's intended
24to be held by this sample holder. And therefore, I think it is outside of the
25disclosure of the prior art.

26 I think because it's the -- discloses resonating in a different

1mode and achieving different objectives than those that are disclosed by
2Yokogawa, that it's not obvious as well.

3 And I think that the point, if claim 8, which includes the
4separation plate, the difference in vacuum where the plasma is generated
5versus where the antenna is and the actual mode of resonance being claimed
6is certainly not disclosed in the prior art.

7 And then finally, I think that the other group of claims, which I
8believe are separately patentable, are 39 and 40 because those claims are
9directed to the diameter of the shower plate.

10 But there are some figures which show the criticality of this
11relationship as well. And they are at figures 19 through 21, and it has to do
12with the critical dimension and decreasing the CVD.

13 I appreciate your time.

14 JUDGE KIMLIN: I guess we have no further questions.
15Thank you for coming.

16 (Whereupon, the proceedings at 2:58 p.m. were concluded.)